

# Battery Charger Systems and Self-Contained Lighting Controls

**Hearing for comment on proposed  
negative declaration and express terms**  
Hearing Room A

October 24, 2011

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# Introduction



# Agenda

- Opening remarks
- Staff presentation: proposed Negative Declaration
- Staff Presentation: Battery charger systems and self-contained lighting controls
- Stakeholder comments
- Closing remarks/next steps



# Purpose of Public Hearing

- Staff will clarify the scope of the proposed: Negative Declaration and Title 20 regulations for battery charger systems and self-contained lighting controls
- Staff will respond to questions
- Allow Staff and Commissioner Douglas to receive oral and written comments on the proposed Negative Declaration and regulations



# Background and Overview

- Background:
  - August 2010 – staff directed to initiate a battery charger system proceeding
- Proceeding History:
  - 3 workshops were conducted
    - October 11, 2010 – IOU CASE Report
    - March 3, 2011 - Draft Staff Report and draft regulations
    - May 19, 2011 – Revised draft regulations



# Document Availability

Proposed Negative Declaration and  
Proposed Battery Charger Systems and  
Self-Contained Lighting Controls  
Regulations are available on the Energy  
Commission's website:

[http://www.energy.ca.gov/appliances/  
battery\\_chargers/](http://www.energy.ca.gov/appliances/battery_chargers/)

Copies of rulemaking documents can also  
be obtained by contacting staff.



# Comment Period

- Comment period for the proposed regulations started on October 7 and will end on November 21.
- Oral and written comments will also be accepted at the Commission adoption hearing scheduled for November 30.



# Next Steps

Staff will evaluate all oral and written comments received and make recommendations to the Commission for the next step.

Staff will respond in writing in the Final Statement of Reasons (FSOR) to all oral or written comments.





# Next Steps: Adoption Hearing

- An adoption hearing is scheduled for November 30, 2011.
- At this meeting the Commission will consider whether to adopt the proposed regulations.
- The Commission may also decide to issue changes to the proposed language, which will require an additional comment period.



# Public Assistance

If you need assistance commenting,  
please contact the  
Public Adviser's Office at

800-822-6228

[PublicAdviser@energy.state.ca.us](mailto:PublicAdviser@energy.state.ca.us)



# The Proposed Regulation



# Scope: Battery Charger Systems

- **Definition of Battery Charger System**  
means a battery charger coupled with its batteries, or battery chargers coupled with their batteries, which together are referred to as *battery charger systems*. This term covers all rechargeable batteries or devices incorporating a rechargeable battery and the chargers used with them.

See section 1602(w) of draft express terms for full definition



# Scope: Battery Charger Systems

- Specific exemptions (see §1601):
  - Many types of motor vehicles
  - FDA class II and class III medical devices
  - Illuminated exit signs
  - Stationary power applications with three phase line-line input voltage of 300 or greater
  - Battery analyzers
  - Voltage/ Voltage and frequency independent uninterruptable power supplies



# Definitions: Battery Charger Systems, general classes

## Small versus Large.

- o Large battery charger systems have a rated input power of more than 2 kW. The rest are considered small battery charger systems.

## Small Consumer versus Small Non-Consumer

- o Follows definition of “consumer product” in 49 U.S.C. Section 32901(a)(3)



# Definitions: Battery Charger Systems, special classes

## Inductive charger system

- A type of “small battery charger system that transfers power to charger through magnetic or electric induction.”

## Battery Backup/UPS system

- A type of small battery charger system “designed to provide power to an end use product in the event of a power outage”



# Definitions: General Battery Charger Systems measurements

## No Battery Mode

- o “is connected to the main electricity supply and the battery is not connected to the charger”

## Maintenance Mode

- o “is connected to the main electricity supply and the battery is fully charged, but is still connected to the charger.”





# Definitions: Small Battery Charger Systems measurements

## 24 hour charge and maintenance energy

- Is the sum of the energy required to charge a discharged battery plus the energy used to maintain the battery over the course of the test.
- This period may exceed 24 hours for low rate chargers.



# Definitions: Large Battery Charger Systems measurements

## Charge Return Factor (CRF)

- Ratio of amp-hours used to charge the battery to amp-hours discharged from the battery

## Power Conversion Efficiency

- DC output power divided by AC input power

## Power Factor

- Ratio of real power to apparent power



# Small Battery Charger Systems: Test Procedure

- Proposing to use the recently adopted Federal test procedure for battery chargers 10 CFR 430.23(aa) (Appendix Y to Subpart B of Part 430) with the following additions:
  - Test with batteries in each port (except no battery mode)
  - When multiple results are provided, report the highest values to the CEC
  - Multi-port calculation instructions.



# Large Battery Charger Systems: Test Procedure

- Continuing to use the existing large battery charger system test procedure with the following modifications:
  - To reduce testing burden provided specification for single charge profile and battery capacity (Charge profile with highest CRF, Battery with lowest capacity and then lowest voltage)
  - Allow testing at discharge voltages other than defined in the test procedure



# Proposed Large Battery Charger System Standards

- Effective date: January 1, 2014
- Charge Return Factor
  - Must be less than or equal to 1.10 when charging from 100% and 80% depth of discharge (DOD)
  - Must be less than or equal to 1.15 when charging from 40% DOD
- Power Conversion Efficiency
  - Must be greater than or equal to 89%



# Proposed Large Battery Charger System Standards Cont'd

- Power Factor
  - Must be greater than or equal to 0.9
- Maintenance Mode Power
  - Must be less than or equal to 10 watts plus an additional wattage of  $0.0012 \times \text{battery capacity}$
- No Battery Mode Power
  - Must be less than or equal to 10 watts



# Proposed Small Battery Charger System Standards

- Effective dates:
  - January 1, 2013 for consumer products
  - January 1, 2017 for non-consumer products
- À la carte chargers that meet specific conditions are granted an additional 5 years to comply



# Proposed Small Battery Charger System Standards Terminology

- Battery capacity:
  - Total energy (watt-hours, Wh) of all batteries as measured by the test procedure. Symbolized by  $E_b$
- Number of Ports
  - Number of separately controlled ports. Symbolized by  $N$



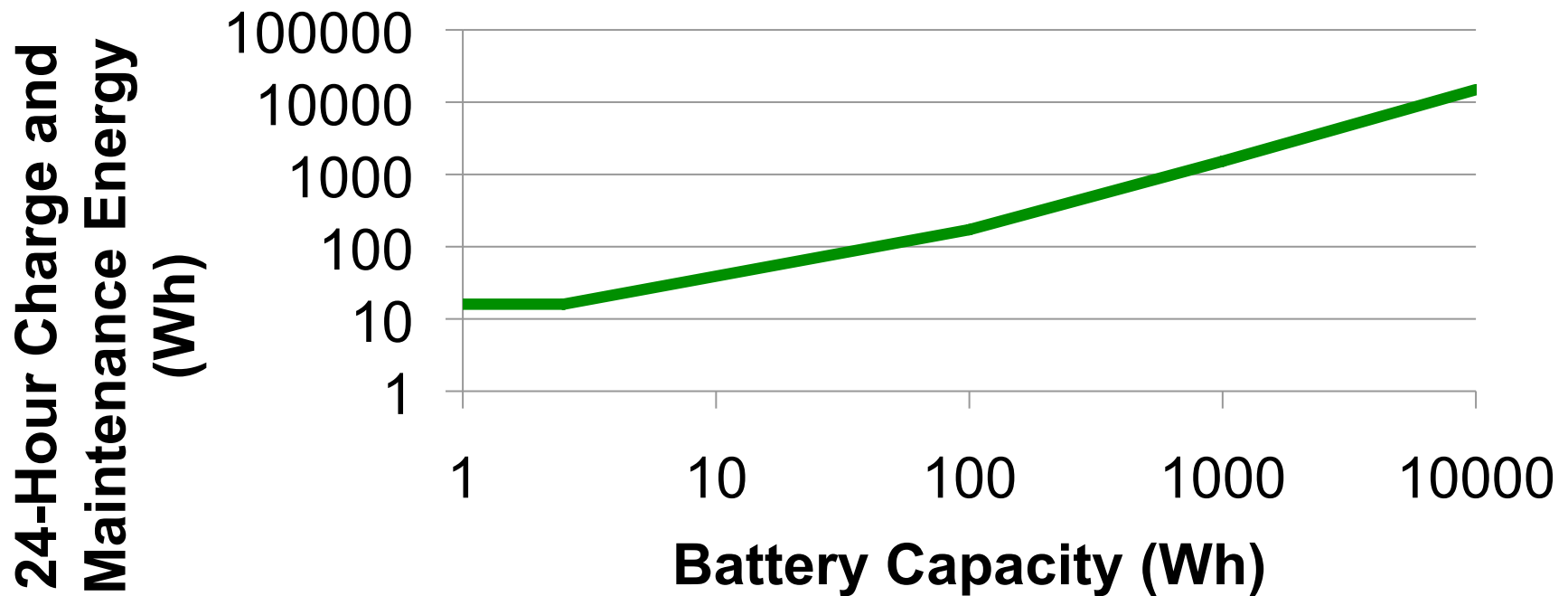


# Proposed Small Battery Charger System Standards cont'd

- 24 hour charge and maintenance energy
  - For  $E_b \leq 2.5 \text{ Wh}$  :  $16 \times N$
  - For  $2.5 < E_b \leq 100 \text{ Wh}$ :  $12 \times N + 1.6 \times E_b$
  - For  $100 < E_b \leq 1000 \text{ Wh}$ :  $22 \times N + 1.5 \times E_b$
  - For  $E_b > 1000 \text{ Wh}$ :  $36.4 \times N + 1.486 \times E_b$



## Small Battery Charger System 24-hour charge and maintenance energy standard (single port, logarithmic)



# Proposed Small Battery Charger System Standards cont'd

- Maintenance and no battery mode power
  - The sum of measured maintenance mode power and no battery mode power must be less than or equal to  $1 \times N + 0.0021 \times E_b$

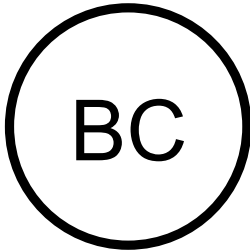


# Proposed Small Battery Charger System Standards special cases

- Inductive charger systems
  - Optionally may comply by consuming one watt or less on average in each measurement
- Battery Backup/ UPS
  - Only regulated for maintenance mode power
  - Must consume less than or equal to  $0.8 + 0.0021 \times E_b$  watts



# Battery Chargers Systems Proposed Labeling

- Requires a circle BC marking on the product that contains the battery charging terminals
  - Example: 
- Requires labels for products with small nameplates to appear on retail packaging and instructions



# Battery Charger Systems Certification

- The proposed regulations would require manufacturers to certify each model to the Energy Commission and submit test results necessary to confirm compliance



# Scope: Lighting Controls

- Covers self-contained lighting controls, defined as:  
a unitary lighting control module where no additional components are required for it to be a fully functional lighting control. Self-contained lighting control includes an astronomical time-switch control; an automatic daylight control; an automatic time-switch control; a dimmer; a lighting photo control; or an occupant sensing device.

See section 1602(l) for full definition



# Self-Contained Lighting Controls

- Proposed regulations add requirements from Title 24, Part 6, Section 119 into Title 20 sections 1601-1608
- These lighting controls are currently required to certify compliance to the Energy Commission. The proposed regulations clarify this process





# Proposed Negative Declaration



# Initial Study/Proposed Negative Declaration

- The proposed negative declaration discusses the environmental impacts of adopting standards for battery charger systems and lighting controls
- The study shows no adverse environmental impacts



# Initial Study/Proposed Negative Declaration: Timeline

- Comment period for negative declaration ends November 12, 2011
- Adoption hearing scheduled for November 30, 2011



# Proposed Regulation Background



# Supporting Information for Proposed Regulation

- Stakeholder input for regulations since first standards workshop notice December 28, 2007
- PIER funded research
- Investor Owned Utilities (IOU) reports, subsequent research, and presentations
- US DOE preliminary analysis for standards and final rule for test procedure



# Stakeholder Input

- Proposed express terms include changes made to minimize burden to industry while maximizing savings
- The May 19, 2011 Committee workshop notice discusses more than 16 changes made from stakeholder input
- Express terms include additional changes from stakeholder input



# Codes and Standards Enhancement Initiative

- The IOU report submitted to the Energy Commission in October 2010 identified battery chargers as:
  - Having significant statewide energy impact
    - 170 million in use
    - Consume 7,700 GWh/year
    - Continue to rise in number
  - Having significant savings potential by applying cost-effective technologies to inefficient battery chargers



# Efficiency Opportunities: Charge Control

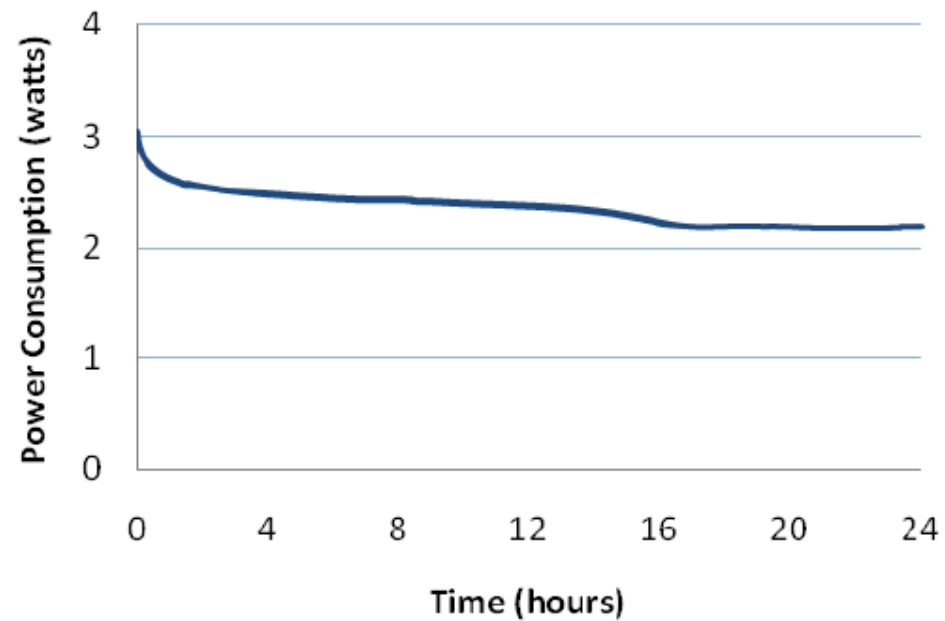
- Introduce or modify charge termination to minimize waste energy by introducing low power, low cost integrated circuits
- Ecos demonstrated this concept in a real power tool
  - For an estimated \$1.20, including markups, improved 24 hour efficiency by 19% and reduced maintenance power by nearly 2 watts with a payback period of ½ a year



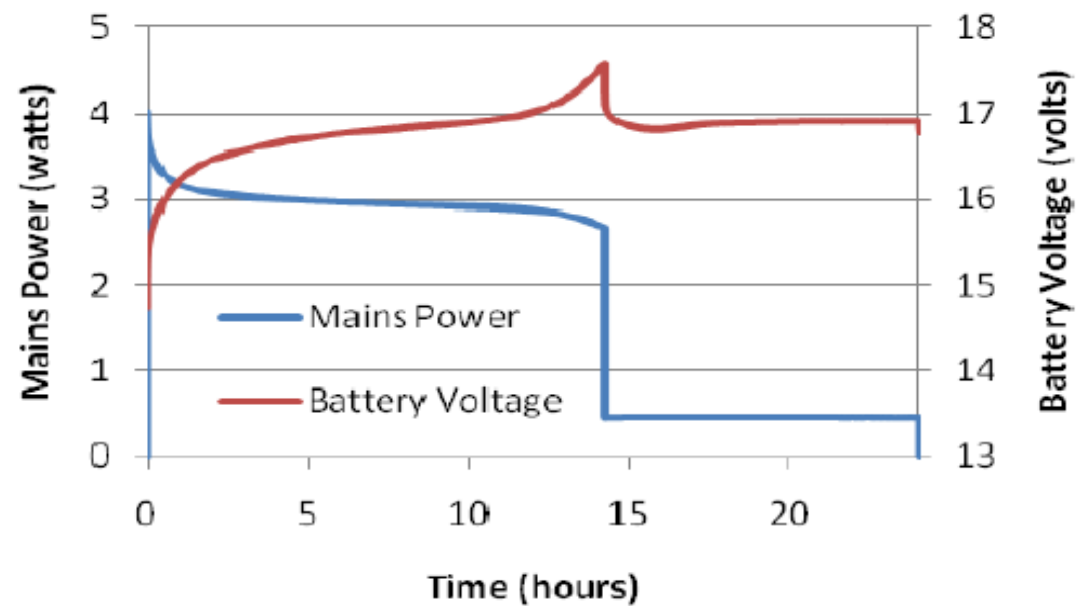


## Charge Profiles:

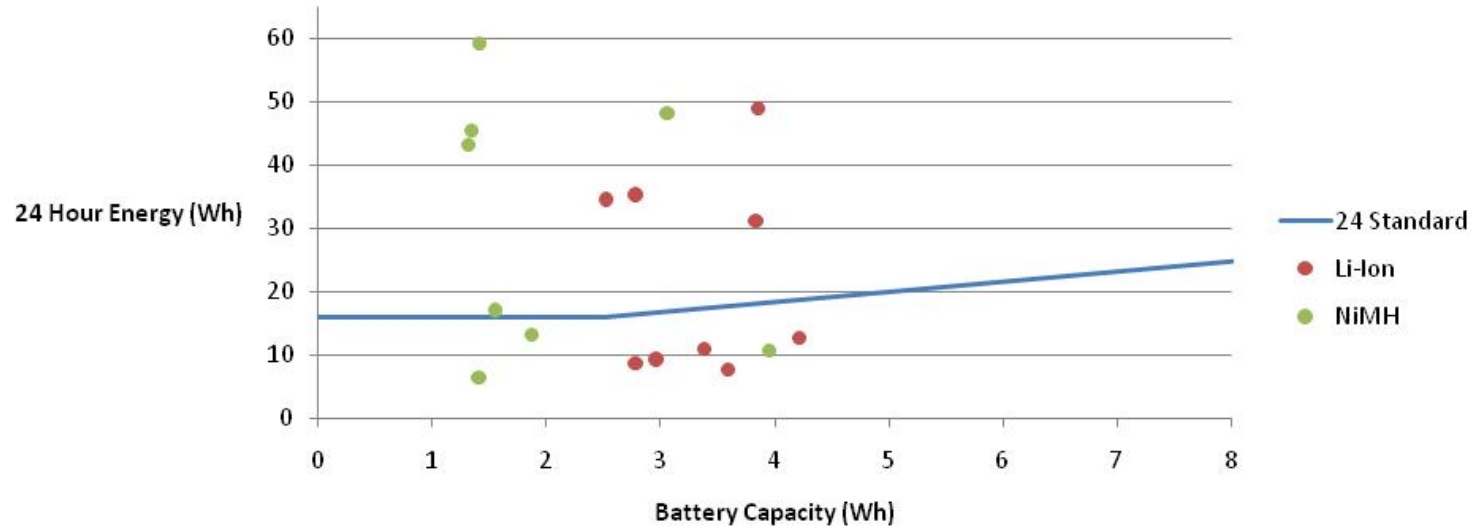
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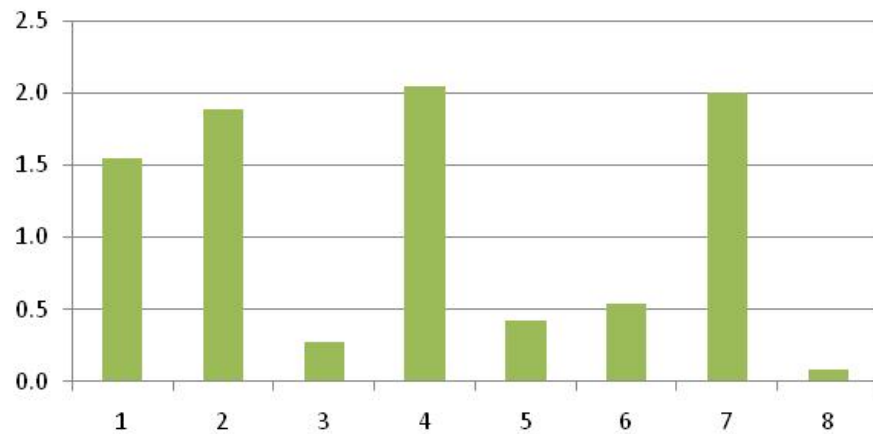
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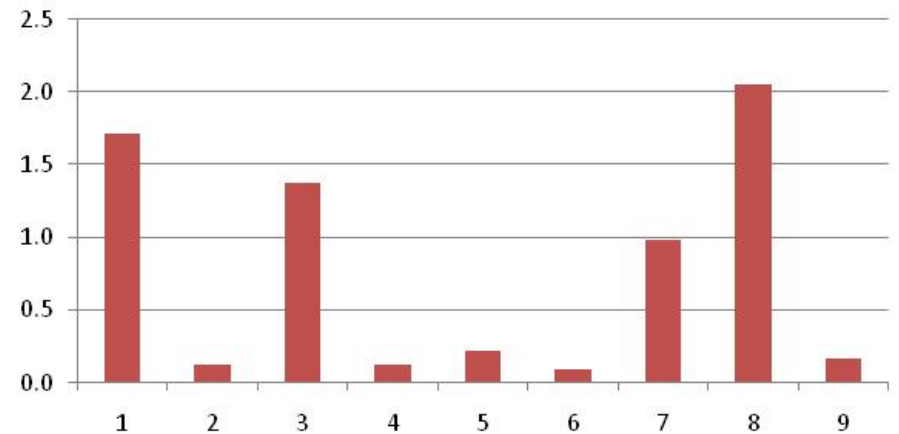
### 24 Hour Energy Standard (zoomed)



### Nickel Maintenance Mode Power



### Lithium Maintenance Mode Power



Vertical axis: power (watts) Horizontal axis: sample number



# Efficiency Opportunities: Other

- Improving AC to DC conversion efficiency is a cost effective approach for many battery charger systems
- Reducing constant power draw from transformers and resistor based current limiters
- Applying strategies and technologies of the broad range of products that meet the proposed standards



**Table 2: Unit Energy Savings and Cost-Effectiveness**

<b>Category</b>	<b>Design Life (Years)</b>	<b>Annual Unit Energy Savings (kWh/year)</b>	<b>Incremental Cost of Improvement Per Unit (\$)</b>	<b>Average Annual Present Value Savings (\$)*</b>	<b>Simple Payback Period (Years)</b>	<b>Life Cycle Benefit (\$)</b>
<b>Small Charger Systems</b>	4.7	13.9	\$0.80	\$1.79	0.41	7.59
<b>Large Charger Systems</b>	15	3294	\$342.86	375.84	0.91	5294.77

Table 2 is based on aggregated large charger units and small charger units weighted by sales and compliance.

\*Present value calculated using 3 percent discount rate and \$0.14 per kWh.

Page 12 of staff report, assumptions available in Appendix A of the staff report.



# Estimated Statewide Savings

- California would save 2,187 GWh/year if all battery charger systems complied with the proposed standards
- This would save \$306 million per year in avoided electricity costs
- Compliance of 2013 consumer product sales alone would save 370 GWh/year



# Comment Process

- Comments due November 21, 2011
- Send hard copy to  
California Energy Commission  
Dockets Office, MS-4  
Re: Docket No. 11-AAER-2  
1516 Ninth Street  
Sacramento, CA 95814-5512
- AND Send a digital copy to  
docket@energy.state.ca.us  
and include Docket No. 11-AAER-2 in the subject line

